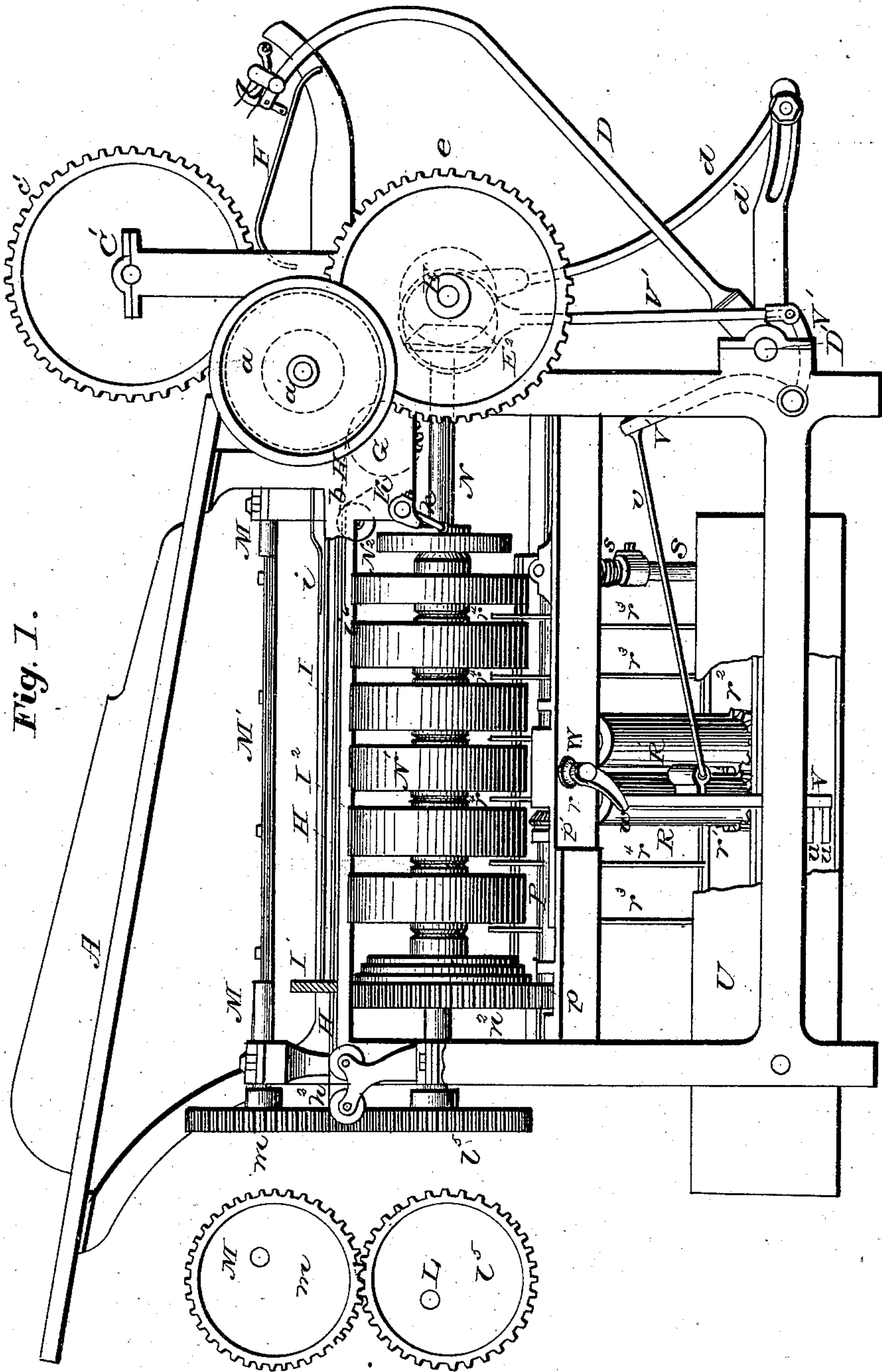


W. SCOTT.
Paper-Folding Machine.

4 Sheets--Sheet 1.

No. 231,853.

Patented Aug. 31, 1880.



Attest:
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Fig. 8.

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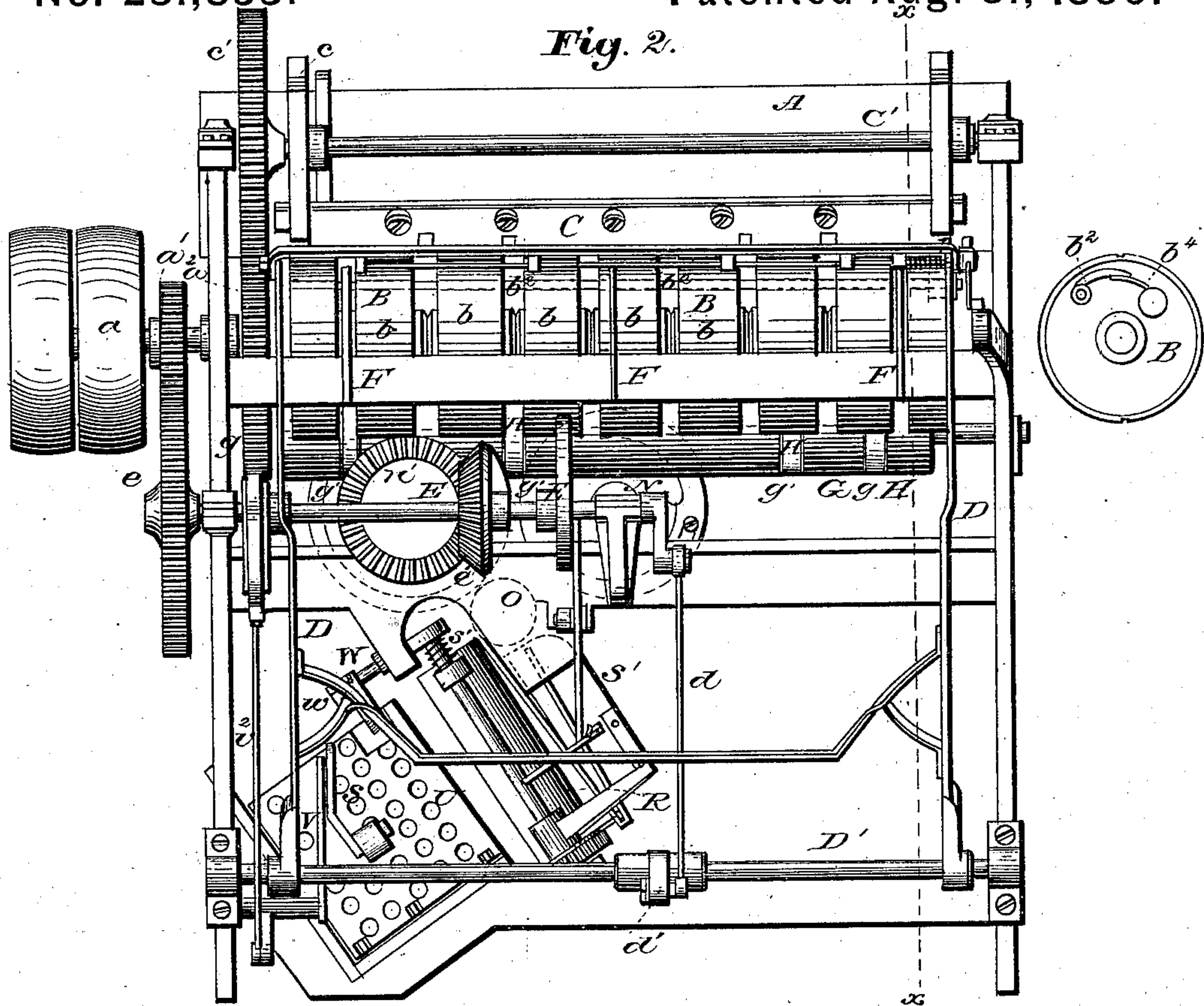


Fig. 5.

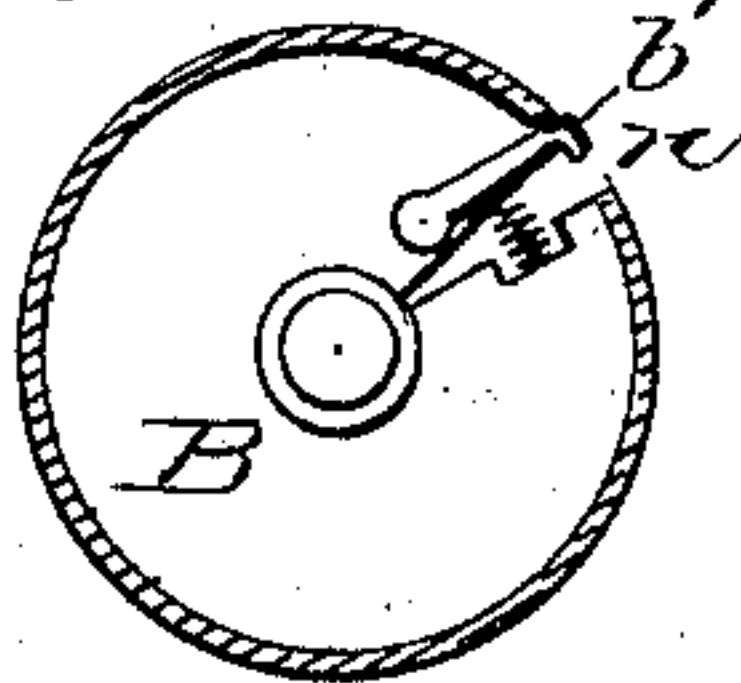


Fig. 7.

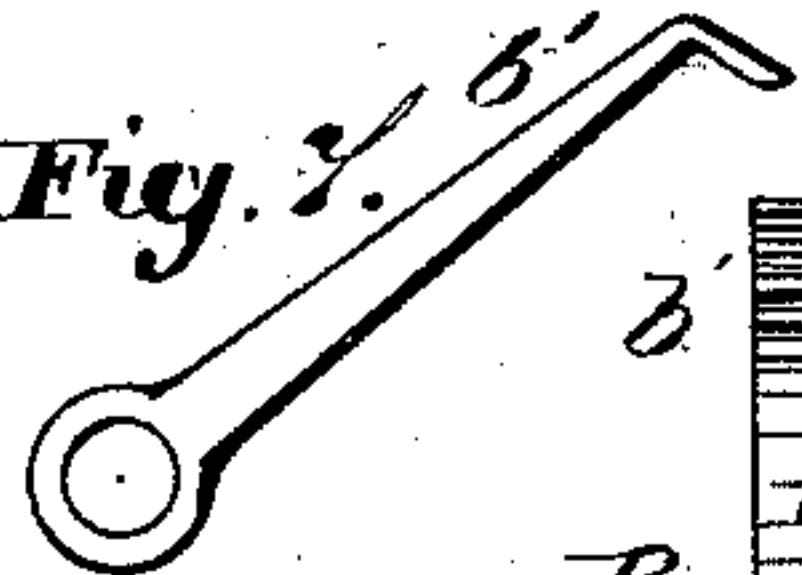


Fig. 4.

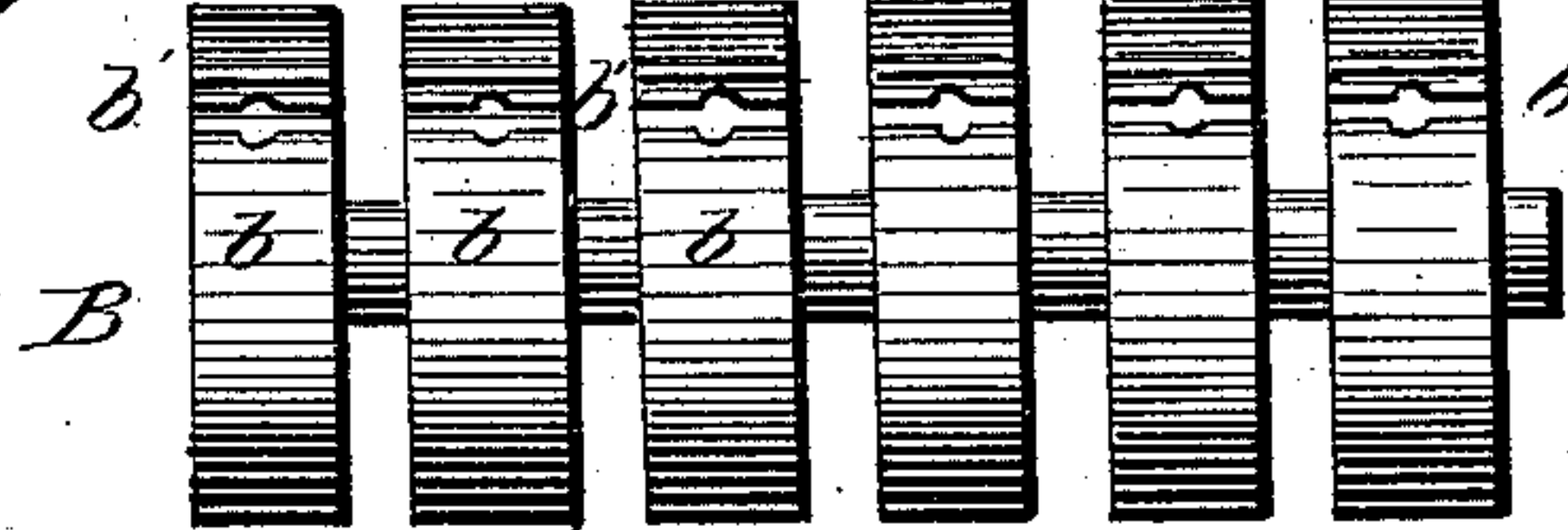
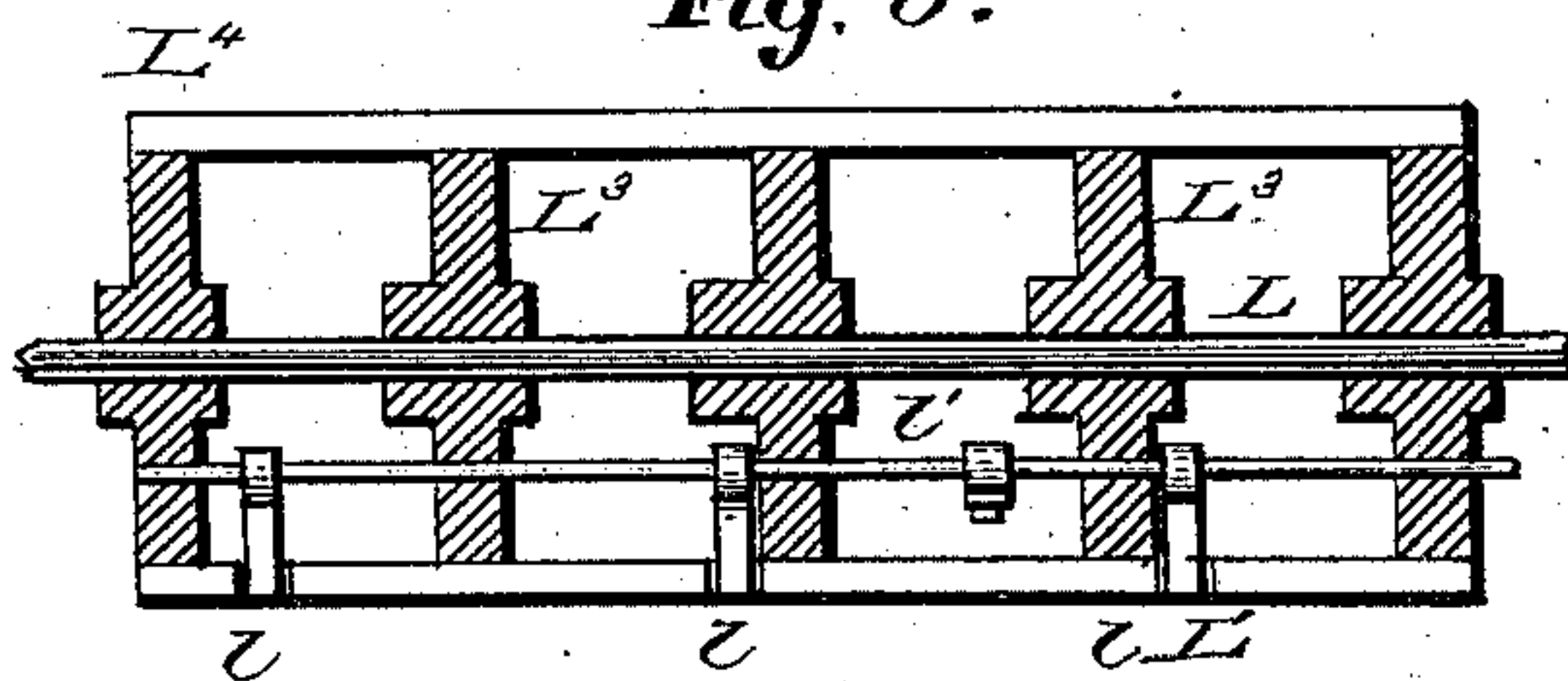


Fig. 6.



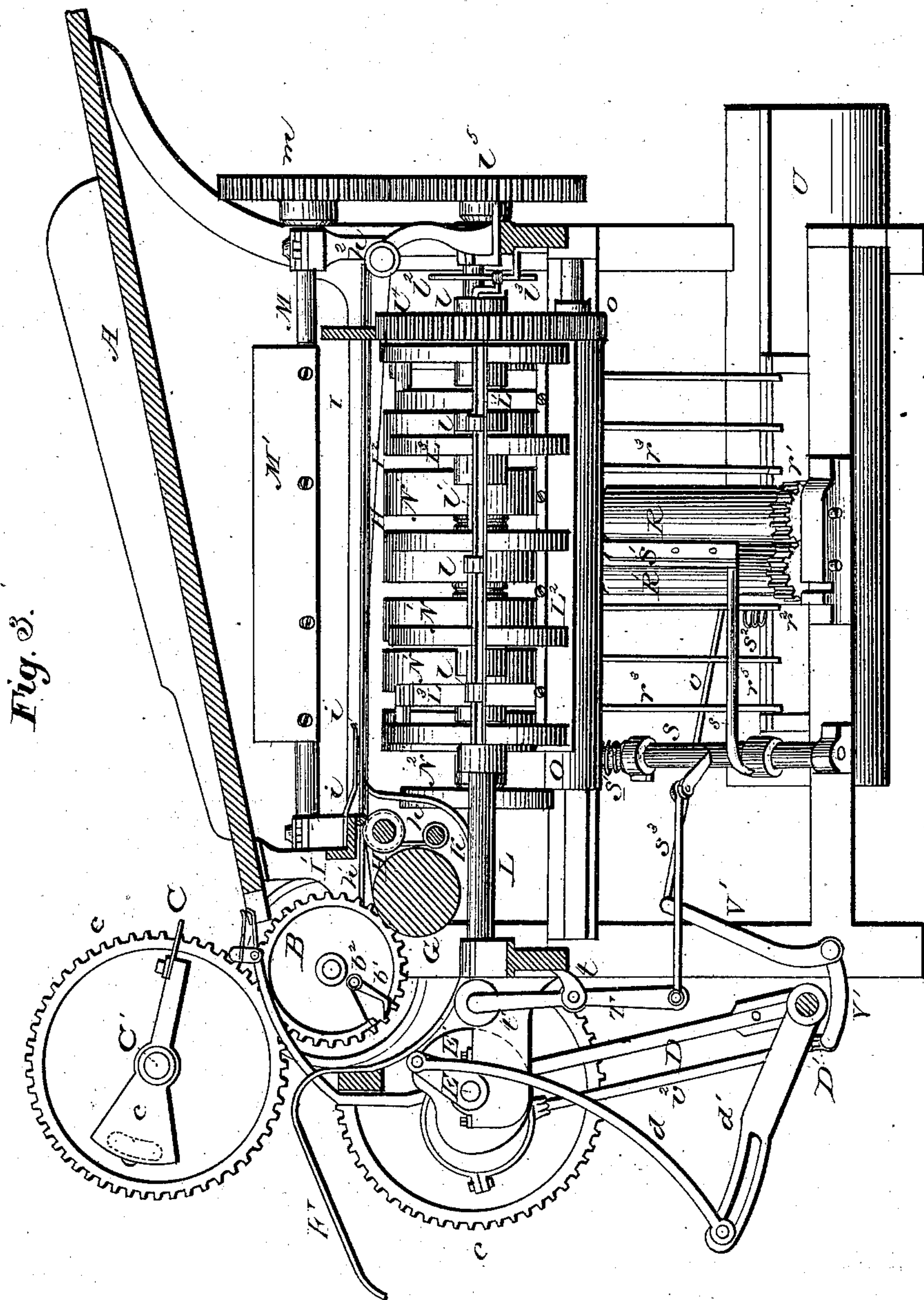
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UNITED STATES PATENT OFFICE.

WALTER SCOTT, OF CHICAGO, ILLINOIS.

PAPER-FOLDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 231,853, dated August 31, 1880.

Application filed December 2, 1879.

To all whom it may concern:

Be it known that I, WALTER SCOTT, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Paper-Folding Machines, said improvement being part of that described in my application filed March 20, 1876, which is fully described in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a side elevation of the folding-machine; Fig. 2, a front-end elevation of the same; Fig. 3, a longitudinal section taken on the line $x\ x$, Fig. 2; Fig. 4, a plan view of one of the folding-cylinders; Fig. 5, a section of one of the folding-cylinders, showing the method of attaching the grippers; Fig. 6, a sectional view of a folding-cylinder, showing another method of attaching grippers; Fig. 7, an enlarged view, showing the form of the grippers when they are to be opened by the creaser; Fig. 8, a detached view of eccentric gearing placed upon the shafts of one set of folders, and Fig. 9 a transverse vertical section of the machine.

My invention relates to machines for folding paper, giving successive folds to sheets of paper as they pass through the machine.

The invention consists in the combination of a vibrating griper with a rotating creaser and folding-cylinder; also, in the combination of a second series of rotating creasers and grippers arranged at right angles, or nearly so, to other folding mechanism, and also in a gripping device for seizing the sheet at its rear end as it is passing through the machine, and thereby stopping it to make successive folds, and also in various improvements in details of construction, which will be hereinafter more fully described.

In the drawings, A represents an inclined feed-board which is mounted upon a frame of any suitable construction to receive and support the folding mechanism. Just in front of the feed-board is placed a cylinder, B, at one end of which is a driving-pulley, a , a small pinion, a' , and a larger one, a^2 . The cylinder B is composed of several sections, b , all placed upon the same shaft and rigidly fixed thereon.

The cylinder is provided with a series of grippers, b' , which are attached to a rod, b^2 , Fig.

5, passing the entire length of the cylinder through the several sections composing it. To one end of the rod b^2 , outside of the cylinder, is rigidly attached a short lever, b^3 , against the outer end of which a spring, b^4 , operates, which is attached to the outer section of the cylinder. This spring, acting against the outer end of the lever, turns the griper end so as to hold the griper back against the forward face of slots in the cylinder-sections within which they are placed.

The grippers may be attached to two or more or all of the sections composing the cylinder at pleasure, and those sections not so provided have grooves in line with the bite of the grippers.

The forward edge of the grippers is slightly beveled, as shown in Fig. 7 of the drawings, and when placed in position upon the folding-cylinder the rear edges are raised slightly above the periphery of the latter. The cylinder is also provided with a longitudinal groove upon its periphery, directly opposite the grippers, to accommodate the idle revolution of the creaser.

A creaser, C, is attached to arms c , which are placed upon a shaft, C' , mounted in bearings above and a little in front of the cylinder B, and upon one end of which is a gear-wheel, c' , which meshes with the gear-wheel a^2 .

A vibrating frame, D, is attached to a rock-shaft, D' , at the lower part of the frame. Motion is communicated to this rock-shaft by means of a connecting-rod, d , attached at one end to an arm, d' , on the rock-shaft, and at the other end to a crank upon a shaft, E, which carries upon its other end a gear-wheel, e , meshing with the pinion a .

At the upper end of the vibrating frame grippers are attached; but as there is nothing peculiar in the construction of either the grippers or the frame, further description is unnecessary.

Bent rods F are attached to a cross-bar of the frame in front of the cylinder B, which support the sheet when it is drawn out by the vibrating griper-frame.

A second folding-roller, G, is placed at the rear of and below the cylinder B, and is adjustable, so that it may be brought into contact with the cylinder B. At one end is a pinion, g , which meshes with the gear-wheel a^2 on the shaft of cylinder B. The roller G is

also provided with a series of grooves, g' , in which conveying-tapes H run around the rollers over guide-pulleys h , mounted upon a shaft, h' , and around pulleys h^2 at the rear end of the machine.

A little above the plane of the tape-conveyer is arranged a series of guide-rods, I, the forward ends of which project beyond their supporting-frame I' I', and enter grooves or spaces in the cylinder B. Just below the plane of the tape-conveyer is placed a stiff rod or roller, I², in front of the shaft L.

Fingers i are attached to the front bar of the frame I', and a little below them is arranged another series of fingers attached to a rock-shaft, K, to which is also attached an arm, k , bearing an anti-friction roller on its outer end, which is held in contact with a cam by a spring on the shaft K, so that whenever the roller enters a depression in the cam the fingers i' are brought into contact with each other.

Below the tape-conveyers is a shaft, L, arranged at right angles, or nearly so, to the folding-rollers and creaser heretofore described. Upon this shaft is mounted a grooved bar, L', the front face of which is recessed to receive the outer ends of grippers l , which are fixed on the front side of the grooved bar upon a rod, l' , and held in position by a spiral spring surrounding the rod. The outer end of the rod l' has a crank-arm upon it, which comes in contact with cams l^2 and l^3 as the shaft is rotated, by which the gripper-rod is turned slightly and the grippers opened to receive and release the paper at the proper intervals.

Rings or disks L³ are placed on the shaft L, which rings or disks serve to support and guide the sheets, and are cut away on each side of the creaser L², as shown in Fig. 9 of the drawings.

A gear-wheel, l^4 , is mounted upon the shaft L just at the end of the folding-bar, and at the end of the shaft is an eccentric gear, l^5 , which meshes with a similar gear-wheel, m , upon the end of a shaft, M, located above the shaft L. A creaser, M', is attached to the shaft M, which operates in connection with the grooved bar on the shaft L.

Upon a shaft, N, arranged parallel to the shaft L, is placed a folding-cylinder, N', which is similar in construction to the cylinder B, already described, except that the grippers n , instead of being fastened to a single rod by which they are moved, are pivoted separately and independently to the sections of the cylinder in which they are placed, or are placed loosely on a single rod running through the cylinder, and are held in position by means of separate springs behind each gripper.

A beveled-gear wheel, n' , is attached to the forward end of the shaft N, which meshes with a corresponding gear-wheel, e' , upon the shaft E, and at the rear end of the shaft N a gear-wheel, n^2 , is attached thereto, which meshes with the gear-wheel l^4 on the shaft L.

A creaser, L², is mounted upon the shaft L,

which operates in connection with the cylinder N' in the same way as the creaser C with cylinder B. A roller, O, is placed just below and a little at one side of the cylinder N', with which it is held in contact and operates in the same manner as the roller G. It is provided with a pinion, o , at one end, which meshes with the wheel n^2 on the shaft N. The shaft N also carries a cam, N², against which the crank k presses, the cam being of such form as to give the proper motion at suitable intervals to the fingers $i i'$.

Immediately below the shaft N is located a small shaft, P, to one end of which a pinion, p , is attached, which meshes with the gear-wheel n^2 , and to the other end of which a beveled pinion, p' , is attached, which meshes with a corresponding beveled gear, r , on the upper end of a roller, R. A pinion, r' , is attached to the lower end of the roller R, which meshes with a corresponding pinion, r^2 , on a roller, R', corresponding to the roller R. This last pair of rollers is arranged in an inclined position and at right angles, or nearly so, to the rollers N' and O. Guide-rods r^3 are placed on each side of the rollers R R', and a second series, r^4 , is arranged just above them, for the purpose of receiving the sheets between them as they come from the folding-rollers immediately above them.

A rock-shaft, S, is arranged in line with the rollers R R', and at some distance forward of them, so as not to obstruct the sheets as they come from the rollers N' O. An arm, s , is attached to the lower end of the shaft S, to the outer end of which is fastened an ordinary vibrating creaser, S'.

A coiled spring, s' , around the shaft S, operates to force the creaser S' down between the rollers whenever it is permitted to act, and below the vibrating arm a spring, s^2 , is placed on the bar r^5 , which acts as a cushion to the vibrating arm s , which strikes against it as it descends.

The rock-shaft S is operated by means of a connecting-rod, s^3 , attached to an arm thereon, and the lower end of a vibrating lever, T, pivoted to the frame at t , and carrying upon its upper end a roller, t' , against which a cam, E', on the shaft E operates, the cam being so formed as to permit the creaser S' to be thrown down quickly by the spring on the rock-shaft at proper intervals, on the sheet over the rollers R R'.

A trough, U, is placed below the rollers R R', to receive the folded papers, within which a packer, V, reciprocates for the purpose of pushing the papers along out of the way as they are discharged. Catches or stops u are attached to the lower side of the receiving-trough, which hold the lower edges of the folded papers from returning as the packer V is withdrawn. A swinging catch or stop, w , is loosely attached to a pin, W, on the frame of the machine, and operates upon the upper edges of the folded papers in a well-known way, to prevent their return when the packer is withdrawn.

The packer V is recessed on its upper and lower edges, to permit of its passing the catches *u* and *w* without interruption, and it also has anti-friction rollers upon its lower edge. A rod, *v*, connects the packer to one arm of a bell-crank lever, V', which is mounted loosely upon a pin attached to the main frame. To the other arm of the lever V' the lower end of an eccentric-rod, *v'*, is attached, which is operated by an eccentric, E², on the shaft E, and this communicates a reciprocating motion to the packer V.

The rotating creasers are attached to their shafts or gear-wheels in such way that they can be accurately adjusted to enter the grooves in the folding-cylinders, and the clevises, which it is necessary to move to adapt the machine to sheets of different sizes, are adjustably attached to their supports.

The operation is as follows: A bank of sheets is placed upon the feed-board A, and as motion is communicated to the mechanism throughout the machine from the pulley *a*, the vibrating griper-frame passes up between the cylinder B and creaser C, seizes the lower edge of a sheet as it is fed down, and draws it forward between the cylinder and creaser, the cylinder and creaser being so geared that the former performs three revolutions while the latter performs two, thus permitting the vibrating griper-frame to pass between them, seize a sheet, and draw it forward without interruption. The movements of the mechanism are so timed that when the sheet is drawn out about half its length the creaser comes down upon it and bends it into the groove in the cylinder B, at the same time opening the grippers so that it may be received. The beveled edges of the grippers facilitate this action of the creaser. As the cylinder revolves, the creaser soon leaves the slot, but the paper is held therein by the grippers, and is carried around and folded by passing between the rollers B and G. As it leaves these rollers it passes on to the conveying-tapes H, by which it is carried to the rear between the folding-bar L' and creaser M, and being stopped at the proper time by the fingers *i i'* catching the rear end a moment just before the wheel reaches the rear stop-bar, I', when the folded sheet is bent into the groove in the griper-bar by the creaser M', and the sheet is drawn over the rod I², thereby making another fold, and carried down by the bar in front of the folding-cylinder N', just as the creaser L² on the shaft L is brought round opposite the groove in the cylinder N', by which it is carried around between the cylinder and the roller O, another fold is made, and the sheet is discharged between the guide-rods *r³ r⁴* in front of the rollers R R', between which it is forced by the creaser S', another fold is made, and the folded sheet is discharged into the trough U in front of the packer V, which reciprocates to move each sheet forward just after it is discharged beyond the catches *u w*.

The grippers on the cylinders B and N are opened to release the sheets at the proper mo-

ment by their elevated rear edges coming into contact with the rollers beneath them, which forces them back; but the grippers on the folder L' are both opened and closed by the crank-arm on the shaft to which they are attached striking against cam-stops suitably located. The grippers on the vibrating frame in front are opened and closed by cam-stops, in the usual way.

The eccentric gears *l⁵ m* are so arranged as to retard the motion of the creaser M while it is in contact with the folding-bar L', so that the creaser will rest against the back edge of the groove as it is withdrawn to enable the grippers to seize the paper more readily.

I do not here claim the following combinations, which constitute the subject-matter of claims in an application heretofore filed by me and now pending, viz: first, a rotating cylinder or carrier provided with nipping-jaws and a rotating folding-blade, in combination with folding mechanism for producing the preceding fold in the paper, the rotating nipping-jaws and rotating folding-blade being arranged at right angles to the mechanism for producing the preceding fold; second, the combination, with rotary mechanism for producing a primary fold, of a rotating folding-blade, a cylinder or carrier provided with nipping-jaws co-operating with said folding-blade to produce a fold in the sheet, said cylinder or carrier being also provided with a folding-blade co-operating with sheet-seizing devices to produce another and parallel fold in the sheet, said mechanism for producing the primary fold being arranged at right angles to said rotating folding-blade, cylinder, or carrier, having nipping-jaws and folding-blade and the co-operating sheet-seizing devices; third, the combination of the rotating folding-blade and a rotating cylinder provided with a set of nipping-jaws and sheet-guiding devices; fourth, the combination of a cylinder or carrier, provided with nipping-jaws, an independent rotating folding-blade, and feeding mechanism, whereby the sheets may be fed in between the ends of the folding-blade and cylinder and in a direction parallel to their shafts; fifth, the combination of a rotating folding-blade, a cylinder provided with nipping-jaws, and a roller with mechanism for producing the preceding fold in the paper, the folding-blade and cylinder with nipping-jaws being arranged at right angles to the mechanism for making the preceding fold and caused to rotate; sixth, in combination with the cylinder or carrier provided with nipping-jaws, a rotating folding-blade carried by a shaft and turning out of contact with the cylinder with which said blade co-operates in folding the sheet, in order that a sheet of paper may have an open space to enter past the blade shaft or edge of the folding-blade and pass longitudinally between it and the nipping-jaws' cylinder at any time during the rotating movement of the folding-blade when the blade is not in contact with the cylinder.

I am also aware that three folding-rolls have

been heretofore used, the first of which is provided with a folding-blade, the second with a folding-blade and griper, and the third with a griper, for the purpose of making two parallel folds in the same sheet, and therefore I do not claim, broadly, the combination of these specified devices.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a rotating creaser, C, cylinder B, provided with grippers, and vibrating gripping-frame D, substantially as described.
2. The grippers *n*, pivoted to the cylinder and constructed with their front edges beveled, as described, in combination with independent holding-springs, substantially as and for the purpose set forth.
3. The combination of the cylinder N', grippers *n*, pivoted directly and independently to the cylinders, and separate holding-springs, substantially as described.
4. The continuously-rotating grooved folding bar or cylinder provided with grippers, in combination with the rotating creaser-blade geared to the cylinder, whereby a continuous and positive rotation is given to said blade and folding mechanism, substantially as described, for producing the preceding fold in the paper, the rotating folding-bar and creaser being arranged at right angles to said mechanism for producing the preceding fold, substantially as and for the purpose set forth.
5. The combination, substantially as described, of the creaser-blade M', grooved folding bar or cylinder L', provided with suitable grippers, creaser L², griper-cylinder N', and mechanism for producing the preceding fold in the paper, the creasers, folding-bar, and griper-cylinder being arranged at right angles to the mechanism for making the preceding fold and caused to rotate, as specified.
6. The inclined rollers R R', arranged at right angles to the cylinder N' and bar L', and having their axes in the same inclined plane, in combination with the packing-trough U and packer V, arranged centrally underneath the opening between the rollers, so that the folded sheets will fall directly from the rollers into the packing-trough, substantially as set forth.

7. The combination of the cylinder and creaser B and C, the rotating grooved bar and creaser L' and M', arranged at right angles to the former, and suitable conveying-tapes H, substantially as described.

8. The combination of the rotating creaser M', grooved bar L', and rod I², substantially as and for the purpose set forth.

9. The combination of the rotating creaser M', the rotating grooved folding bar or cylinder L', and mechanism, substantially as described, whereby the creaser and bar are speeded so that the edge of the former moves more slowly than the surface of the groove in which it works while they are in contact, substantially as and for the purpose set forth.

10. The combination of the shafts L and M, grooved folding-bar L', creaser M', and eccentric gear-wheels l⁵ m, substantially as and for the purpose set forth.

11. The combination of a vibrating arm, s, carrying the creaser S', and a cushioning-spring, s², substantially as described.

12. The combination of the folding bar or cylinder L', the independent revolving creasing-blade M', both constructed substantially as described, and feeding mechanism whereby the sheets may be fed in between the ends of the creaser and cylinder, and in a direction parallel to their shafts, as and for the purpose set forth.

13. The combination of the folding-cylinder L', independent revolving creasing-blade M', and conveying-tapes H, running parallel to the shafts of the cylinder and creaser, substantially as and for the purpose set forth.

14. The combination of the griper-cylinder B, having two or more longitudinal grooves, and the revolving creasing-blade C, arranged and geared substantially as described, so that the former performs a greater number of revolutions than the latter and the creaser enters the grippers only when the sheet is in position to make a fold.

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Witnesses:

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